X. *Account of an extraordinary Appearance in a Miſt. By Mr.* William Cockin; *communicated by* Joſeph Banks, *Eſq. P. R. S.*

Read Feb. 20, 1780.

Lancaſter, Sept. 2, 1777.

JANUARY 13, 1768, betwixt nine and ten in the morning, being on an eminence that overlooked ſome low meadow ground, I obſerved, in a direction oppoſite to that of the ſun, which ſhone very bright, and in a miſt which covered the ſaid incloſures, an unuſual meteor, which, without attempting to name it, I ſhall deſcribe as well as I can by the help of the following figure.

At about the diſtance of half a mile, and incurvated towards each other, like the lower ends of the common rainbow, there appeared in the miſt two places of a peculiar brightneſs as repreſented at A A. They ſeemed (as is common) to reſt upon the ground, were continued as high as the miſt, and in breadth, perhaps, near half as much more as that of the iris. In the middle, between theſe two places, on the ſame horizontal line, was a coloured

loured appearance like *dcb*, *a*, *bcd*, whoſe baſe could not at moſt ſubtend an angle of above ten or twelve degrees, and whoſe interior parts were thus variegated. The center *a* was dark and irregularly terminated, as if made by the ſhadow of ſome object not bigger than an ordinary ſheaf of corn. Next this center was a curved ſpace *bb*, of a yellowiſh flame colour. To this ſucceeded another curved ſpace of nearly the ſame dark caſt as the center, ſeemingly tinged with a faint hue of green, and very evenly bounded on each ſide, as is ſhewn at *cc*. After theſe came on the terminating ring, which was coloured very much in the manner of the common rainbow, except that the tints were not quite ſo vivid (as if owing to the effect of a yellowiſh tinge, which ſeemingly entered into the compoſition of all the colours) nor their boundaries ſo well defined. The center of the image appeared to be exactly in the line of aſpect (as it is called) or one conceived to be drawn from the ſun through the eye of the ſpectator; and it may be obſerved from the figure, that theſe curve ſpaces were not ſegments of perfect circles, but formed like the ends of concentric ellipſes, whoſe tranſverſe axiſes were perpendicular to the horizon.

To the above deſcription of the image it may be neceſſary to add the following particulars which attended it.

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The miſt was very thick near the ſurface of the meadows, though rarer upwards, and chiefly, if not ſolely, on the ſide of the hill oppoſite to the ſun. The place where I ſtood was juſt on its confines; and I found, as I advanced into it, that the object became gradually fainter and fainter. As the ſun diſperſed the vapour, the appearance faded proportionably; and about half an hour after I firſt ſaw it, it was ſcarcely viſible. The evening before was wet; but the drops on the hedges were congealed by froſt. Where the ſun ſhone the buſhes were each inveſted with a miſt, as if owing to the vapours exhaled from them by the ſun's warmth; and, on a nearer inſpection (for there was ſomething ſingular in this appearance), I was rather ſurprized to find, I could clearly diſcern the little humid particles which occaſioned it, and which were floating around the buſhes at about half an inch diſtance from one another.

Such were the moſt material circumſtances of this beautiful and ſingular appearance. Singular no doubt it is, as we have only two inſtances of a like kind mentioned in Dr. PRIESTLEY's Hiſtory of Light and Colours. The firſt is given by M. BOUGUER as ſeen upon the Andes(a); and

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(a) This is deſcribed as ſeen in a cloud conſiſting of frozen particles, and at about thirty paces diſtance. All the parts of the obſerver were clearly ſhadowed out, as legs, arms, and head, about which laſt parts the coloured circles were formed. It is farther noted, that the intervals between the circles continued equal, though their diameters were conſtantly changing.

and the other by Dr. MACFAIT as ſeen in Scotland[(b)]. A third, however, may be met with as obſerved at Pambamarca[(c)], in ULLOA's Voyage to South America.

It is the pleaſure of philoſophy to attempt ſomething by way of ſolution concerning every extraordinary fact which falls under its cognizance: and though it be not always ſo happy as to produce ſatisfaction, it may at leaſt ſucceed in the way of amuſement. Under the influence of theſe notions, let us ſee what offers reſpecting the philoſophy of the curious appearance before us.

With regard to the elliptical form of the curve ſpaces, as it cannot be accounted for from refraction, I apprehend it is owing to the oblong figure of the obſerver's ſhadow, which is very evidently the dark part in the middle, and to which the coloured marginal rings are in ſome ſort obliged to conform. The bright places AA correſpond to an appearance once obſerved by Dr. SMITH[(d)], and which he very plauſibly attributes to a confuſed mixture of the principal reflected beams

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(b) This was ſeen in an extremely thick fog or miſt. The interval correſponding to *bb* was obſerved to conſiſt of colours ſimilar to, though fainter than, thoſe of *dd*.

(c) The apparent diſtance is here placed at about ten toiſes. The vapours are ſaid to be of a tenuity cognizable by the ſight. The gradual change of the diameter of the rings is mentioned; as alſo, that they appeared at firſt to be of an elliptical figure.

(d) See Art. 502. of the remarks at the end of his Optics.

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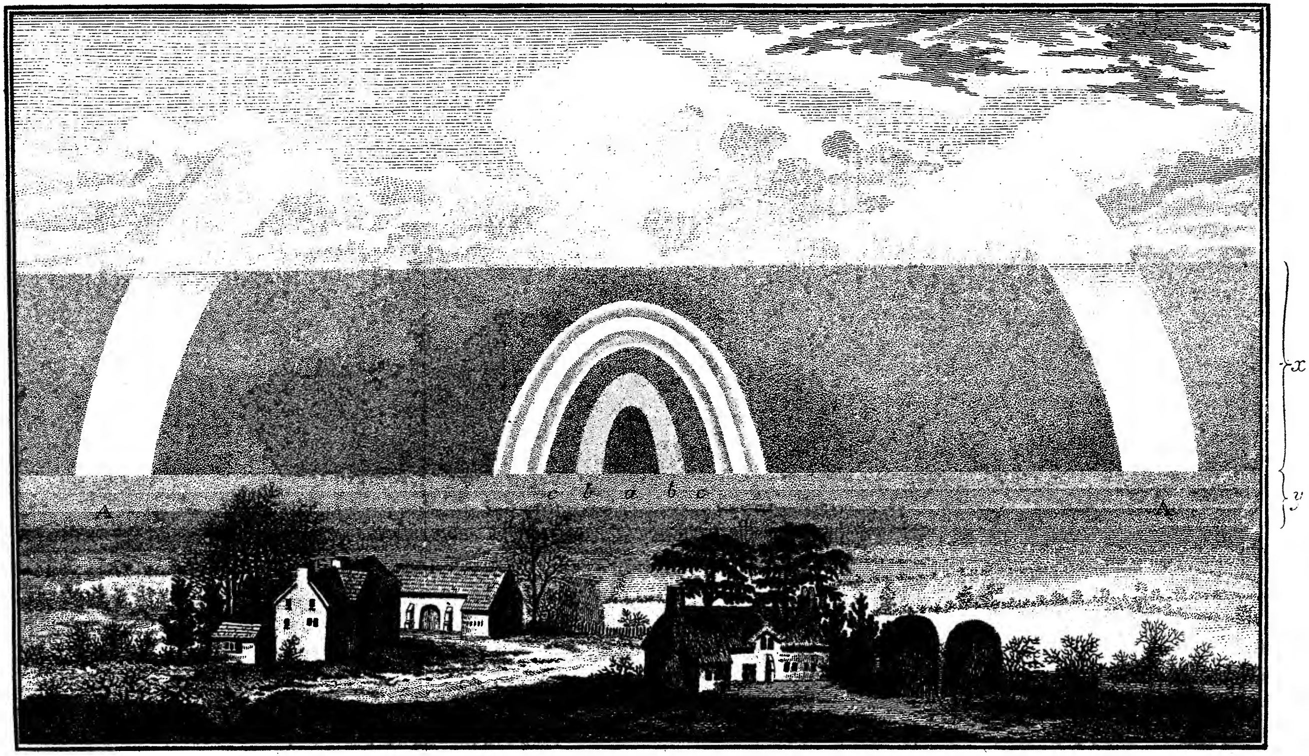
that exhibit the ordinary bow. This muſt be owing to ſomething peculiar in the miſt, as to the form, ſize, &c. of its particles or globules; eaſier to conceive than explain. In the valuable Treatiſe of Optics by the laſt named gentleman, there is an account of Dr. PEMBERTON's theory for the ſlender rings of colours, which are ſometimes ſeen within the rainbow, which Dr. LANGWITH firſt deſcribed in the Philoſophical Tranſactions (e), and from which ſome idea may be formed of the cauſe of the coloured part of the image. It is in ſubſtance this (f). If the drops of rain, &c. which the ſun ſhines upon be exceedingly ſmall, from the irregular reflection of all ſurfaces, and the fits of eaſy tranſmiſſion, which the diſſipated rays may undergo in their paſſage through thoſe little globules, there may naturally be formed other coloured arches within the common bow for a number of ſucceſſions. Hence, with regard to the inſtance in queſtion, ſince its rings were ſo very ſmall in diameter, it appears, that on ſome account or other the refracted, coloured, and diſſipated rays alluded to, have in their return to the eye nearly made the ſmalleſt angles poſſible with the lines of incidence.

(e) N° 375.

(f) See Articles 506, 507.

After all, this is only to be conſidered as conjecture. Though it does not want analogy, we have not had it yet properly aſcertained by experiment: and hence it is not without reaſon, that Dr. PRIESTLEY conſiders the additional rows of colours within the common rainbow obſerved by Dr. LANGWITH, and thoſe of the ſpecies of image here deſcribed, as one of the *deſiderata* of optics.

Philos. Trans. Vol. LXX. Tab. *V. p. 162.*



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